Ocean Surveyor
Ocean Observer

Troubleshooting Guide

RD Instruments
Acoustic Doppler Solutions

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Ocean Surveyor Troubleshooting Guide

1 Introduction

The provided information assumes that faults are isolated with a large degree of certainty to a least replaceable assembly (LRA) level only. Considering the complexity of the Ocean Surveyor, it is RD Instrument's intention to provide as much information as practical for field repair; fault location to the component level is beyond the scope of these instructions. The mean time to repair the system will be minimized if an entire replacement unit is available in the field. If time to repair is of essence, RD Instruments strongly advises the availability of the listed LRAs.

Table 1: List of Least Replaceable Assemblies

LRA	Description:
Electronics Chassis	The Electronics Chassis contains all electronics necessary to supply power, provide user communication and interface, transmit and receive signals, interfaces to sensors, and process data.
Transducer Cable	Connects the transducer with the Electronics Chassis.
Transducer	The entire transducer, includes the transducer electronics, transducer housing, transducer ceramic assemblies, and connector.

Since these LRAs are manufactured in different configurations, please contact RD Instruments (see "Technical Support," page 25 for contact information) to obtain the correct part number for your specific system configuration. When contacting RD Instruments about a replacement assembly, please provide the serial numbers of the Transducer and Electronics Unit. If you want to replace the Transducer Cable only, then please provide the cable length and connector style (straight or angled) for both the Underwater Transducer Connector and the Dry-side Electronics Chassis Connector.

1.1 Equipment Required

Special test equipment is not needed for trouble shooting and fault isolation. The required equipment is listed in Table 2. Any equipment satisfying the critical specification listed may be used.

Table 2: Required Test Equipment

Required Test Equipment	Critical Specification
DMM	Resolution: 3 ½ digit
	DC-Voltage Range: 200 mV, 2V, 20 V, 200V
	DC-Voltage Accuracy: ± 1%
	AC-Voltage Range: 200 V, 450 V
	AC-Voltage Accuracy: ± 2%
	Resistance Range: 200, 2 k, 20 k, 200 k, 20 MOhm
	Res.-Accuracy: ± 2% @ 200 Ohm to 200 kOhm
	Res.-Accuracy: ± 5% @ 20 MOhm
	Capacitance Range: 20 nF, 2 uF, 20 uF
	Capacitance Accuracy: ± 5%
Serial Data EIA Break-Out Box such as from International Data Sciences, Inc. 475 Jefferson Boulevard Warwick, RI 02886-1317 USA.	Model 60 or similar is recommended as it eases the troubleshooting of RS-232 communication problems significantly. Other manufacturers or models may be substituted.

NOTE. The EIA Break-out Panel is not absolutely necessary but eases RS-232 communication problems troubleshooting significantly.

1.2 Basic Steps in Troubleshooting the Ocean Surveyor

The first step in troubleshooting is determining what type of failure has occurred. In principal, there are four types of failure classes:

- Communication failure
- Built-In Test (BIT) or other electronics failure
- Beam failure
- Sensor failure

Communication failures involve the host computer, the Ocean Surveyor Electronics Chassis, and the serial communication cable. The symptoms may include that the system is not responding, or does not respond in a proper fashion (for example "garbled" text).

BIT failures will appear when the system diagnostics are run. Use RD Instruments software utility *BBTalk* to identify the failing test.

Beam failures can be identified when collecting data or when the system diagnostics are run.

Sensor tests can also be identified when collecting data or during the user-interactive performance tests. The sensor may send incorrect data or is not identified by the system.

2 Troubleshooting

Although the Ocean Surveyor is designed for maximum reliability, it is possible for a fault to occur. This section explains how to troubleshoot and fault isolate problems to the LRA level. Before troubleshooting, review the procedures, figures, and tables in this book. Also, read the "System Overview," page 32 to understand how the Ocean Surveyor processes data.

> **CAUTION.** Under all circumstances, follow the safety rules listed in "Troubleshooting Safety," page 4.

> **CAUTION.** Do NOT ping the Ocean Surveyor with the transducer in air. The power assembly board will short, causing the electronics chassis to no longer communicate. The transducer is pinged by sending a CS or PT5 command or if *VmDas* is started for collecting data – either of these methods will cause damage if the transducer is in air.

2.1 Troubleshooting Safety

Follow all safety rules while troubleshooting.

CAUTION. Servicing instructions are for use by service-trained personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so.

CAUTION. Complete the ground path. **The power cord and the outlet used must have functional grounds.** Before main power is supplied to the Ocean Surveyor, the protective earth terminal of the instrument must be connected to the protective conductor of the mains power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.

CAUTION. If this instrument is supplied via an auto-transformer, make sure the common terminal is connected to the earth terminal of the power source.

CAUTION. Any interruption of the earthing (grounding) conductor, inside or outside the instrument, or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury.

CAUTION. Only fuses with the required rated current, voltage, and specified type must be used. Do not repair fuses or short circuit fuse-holders. To do so could cause a shock or fire hazard.

CAUTION. Do not operate the Ocean Surveyor Electronics Chassis in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

CAUTION. Do not install substitute parts or perform any unauthorized modifications to the instrument.

CAUTION. Measurements described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

CAUTION. Do not attempt to open or service the power supply.

CAUTION. Any maintenance and repair of the opened instrument under voltage should be avoided as much as possible, and when inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

CAUTION. Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

2.2 Troubleshooting a Communication Failure

Ocean Surveyor ADCPs communicate by means of two serial communication channels. The user can choose between RS-232 and RS-422 types of asynchronous serial interfaces by connecting to either J4 (RS-232) or J3 (RS-422) on the rear panel of the Electronics Chassis.

The Ocean Surveyor selects the user communications port simply by detecting on which channel it received its *Break* signal. From this point on forward, it uses that channel until it receives a new *Break* signal on the other channel.

To successfully communicate, both the host computer and the Ocean Surveyor must communicate using the same type of serial interface. Standard serial interfaces in IBM compatible computers are also RS-232. RS-422 communication requires an appropriate communications board for the host computer.

> **NOTE.** If you are using a high baud rate and a long serial cable (greater then 15 meters) RS-232 may not work properly. Change to RS-422 and try to wakeup the Ocean Surveyor again.

2.2.1 Communication Failure Quick Checks

If you cannot communicate with the Ocean Surveyor/Observer (i.e., no wakeup message), you need to isolate the problem to a computer fault, power, communication cable failure, or an Electronic Chassis problem. Verify the following.

a. Connect the Ocean Surveyor to a computer according to the Ocean Surveyor Read This First Guide. Check that all cable connections are tight.

b. Make sure that Mains power to the host computer and the Ocean Surveyor is connected and has the proper voltage. Verify that the Ocean Surveyor front panel circuit breaker switch is in the ON position and that the power status LED next to the circuit breaker is lit. If power is present but the power status LED is not lit then you should check the power supply voltages inside the Electronic Chassis (see "Checking the Power Supply," page 9).

c. Make sure that your computer and the *BBTalk* program are set up to use the communication port the serial cable is connected to on the electronic chassis.

> **NOTE.** Most communication problems are associated with incorrect cable connections (i.e. the serial cable is connected to the wrong port) or data protocols (i.e. the wrong baud rate is set between the Ocean Surveyor and computer).

2.2.2 Checking the Serial Communications Channels

The following procedure checks the serial communications channels using an EIA Break-Out Box. If you do not have an EIA Break-Out Box, use "Checking the Serial Cable," page 7 to verify the communications. If you are using RS-422 serial communications, you can not use an EIA Break-Out Box. Use the "RS-422 Communication," page 6 checks to verify the communications.

a. If you are using RS-232 for your communications port, connect a serial data EIA Break-Out Box between the serial cable and the Ocean Surveyor Electronics Chassis.

b. Send a Break and verify via the LEDs on the Break-Out Box that the Break signal arrives at the proper pin at the Ocean Surveyor (see Figure 9, page 31). If it does, verify that the front panel LED marked RXD lights up temporarily.

   If the Break signal does not arrive at the proper pin or not at all, disconnect the serial cable from the Ocean Surveyor Electronics Chassis, and troubleshoot the communication channel between the host computer and that end of the serial communications cable.

   If the Break signal does arrive at the proper pin but the front panel RXD LED does not light up then there may be a problem with the Ocean Surveyor Electronics Chassis (see "Electronics Chassis Checks," page 8).

c. If the Break signal does arrive at the proper pin and the front panel LED labeled RXD lights up temporarily, this indicates the Break signal does arrive at the Ocean Surveyor Electronics Chassis.

   The Ocean Surveyor must now respond with a 'Wake-up" message. The front panel TXD LED should intermittently light up. If it does not, then there is most likely a problem with the Ocean Surveyor Electronics Chassis (see "Electronics Chassis Checks," page 8).

   If the TXD LED does light up then the Break-out Panel should receive the signal at the proper pin. If this is the case, then the Ocean Surveyor Electronics Chassis's data path seems in principal to be operational. If the wakeup message is not readable, check for a communication mismatch (see "Communication Mismatch," page 7).

2.2.3 RS-422 Communication

If you use the RS-422 port as your communications port, you can not use the Break-Out Box. Do the following checks to verify the RS-422 communication port is functioning.

a. In addition of having transmit and receive pairs interchanged, you may have also the "A" and "B" lines of the transmit and/or receive pair interchanged. Verify the communications cable connections according to the schematics provided (see Figure 9, page 31).

b. Check that the differential "A"-"B" receive pair are not interchanged (as seen from your host computer). Verify the communications cable connections according to the schematics provided (see Figure 9, page 31).

> **NOTE.** For the Ocean Surveyor ADCP, Channel A represents signals that start high and transition low. Channel B represents signals that start low and transition high.

c. When you send a *Break* and the data is not the Wake-Up message, you may have a Baud rate or parity mismatch between the Ocean Surveyor and the computer (see "Communication Mismatch," page 7).

2.2.4 Communication Mismatch

The following conditions may indicate a communications mismatch.

- Sending a *Break* causes non-alphanumeric characters to appear on the screen that may keep scrolling. This may happen when the computer is using RS-232 and the Electronics Chassis is connected to the RS-422 port or vice-versa.
- Sending a *Break* causes non-alphanumeric characters to appear on the screen. These characters do not keep scrolling. Check that the ADCP and computer are both using the same baud rate (CB-command). See the Command and Output Data Format guide for a description of the CB commands.

2.2.5 Checking the Serial Cable

This test will check the serial communication cable between the computer and Ocean Surveyor *without* using an EIA Break-Out Box.

a. Disconnect both ends of the serial cable and measure the continuity using a DMM (see Figure 9, page 31 for the wiring diagram). Correct any problems found.

b. Reconnect the serial cable to host computer. Start the RD Instruments software utility program *BBTalk* on your computer. Make sure to select the proper communications port (see the RDI Tools User's Guide).

c. For testing a RS-232 cable, jumper pins 2 and 3 at the far end of the cable. To check a RS-422 cable, connect one jumper between pin 2 to 4, and one jumper between pins 7 to 8.

d. Type any characters on the keyboard. The keys you type should be echoed on the screen. If you see some characters, but not correctly, the cable may be too long for the baud rate. Try a lower baud rate. If this works disconnect the jumper and then push any keys on the keyboard. You should NOT see anything you type.

e. If you use cables that are **not** supplied by RD Instruments you must make sure that transmit and receive pairs are not interchanged. The above loop-back test does not show if transmit and receive pairs are interchanged. Thus, it is important that you check the wiring diagrams provided in Figure 9, page 31.

NOTE. A loop-back test does not show if transmit and receive wires or pairs are interchanged, even though characters may be displayed correctly.

f. If the keys are echoed correctly on the screen, the computer and the communication cable are most likely good. Re-connect the serial cable to the Ocean Surveyor electronic chassis. If the Ocean Surveyor still does not wakeup, there could still be a problem with the Electronic Chassis.

2.2.6 Electronics Chassis Checks

Once you have eliminated possible problems with the Ocean Surveyor system power, the serial data communication cable, and the host computer, that may leave the Ocean Surveyor Electronics Chassis as the source of the problem. Check the following conditions.

CAUTION. The Ocean Surveyor contains Electro Static Sensitive Devices. You must take accepted ESD prevention measures **before** opening the Ocean Surveyor electronics chassis.

a. One of the interconnecting cables between the Motherboard inside the Electronic Chassis may not be fully seated. Turn off power. Remove the top cover of the Electronic Chassis and check that all of the cables are properly seated.

b. Make sure power to the Ocean Surveyor is connected and that the circuit breaker is in the ON position. Verify that the power status LED indicator located at the front panel next to the circuit breaker switch is lit. If the LED is not on, skip to "Checking the Power Supply," page 9.

c. Reset the system by locating the push button switch S2 on the Motherboard and momentarily depress the switch. Observe the TXD LED for lighting up, and the computer screen for displaying the Wake-Up message.

d. Switch Mains power to the Electronics Chassis off, and after a few seconds on again. Repeat the wakeup procedure from the beginning. If the system does not respond normally, it is malfunctioning and you should contact RD Instruments.

2.2.7 Checking the Power Supply

The following test is done with a voltmeter to verify the voltage levels inside the Electronic Chassis.

Use the test points on the Power Assembly board located in the top right corner of the Electronic Chassis. Use Table 3 to verify the system voltages. If the voltage at test point TP3 is not present, check and replace fuse F1 if necessary. Observe all safety precautions.

If after replacing the fuse F1 the voltages listed in Table 3 are still not present with applied mains power or fuse F1 blows again, it may be necessary to replace the Ocean Surveyor Electronics Chassis.

> **CAUTION.** Only fuses with the required rated current, voltage, and specified type must be used. Do not repair fuses, or short circuit fuse holders. To do so could cause a fire hazard. Disconnect the power cord before attempting to replace fuse F1.

Table 3: Electronic Chassis Voltage Checks

Test Point	Value	Description
TP0	0 VDC	GND, ground reference
TP1	4.95 ≤ Vdc ≤ 5.05	VCC, Electronics power
TP2	11.5 ≤ Vdc 12.5	VXDC, Transducer power
TP3	47 ≤ Vdc ≤ 49	VXMT, Transmitter supply
TP4	9.0 ≤ Vdc 11.5	VGG, Transmitter gate drive supply

> **NOTE.** The voltage measured at test point TP3 is also the output voltage from the Electronic Chassis power supply.

<u>Example Problem - The Electronic Chassis does not Power up</u>

When the power switch is turned on, no LEDs light up. The fuse F1 is good. Measuring the voltage at TP3 indicates that the electronic chassis power supply is bad. However, this could be misleading because the Power Assembly board may have shorted out and this is causing the power supply to shut down.

If the power supply fan is running, then most likely the power supply is OK and a shorted Power Assembly board is causing the problem.

> **NOTE.** Replacing the Power Assembly board or Power Supply in the field is not recommended. Return the chassis to RDI for repair.

> **NOTE.** Pinging the transducer in air is the leading cause of shorting the Power Assembly board. **Never ping the transducer in air.**

2.3 Troubleshooting a Built-In Test Failure

The built-in diagnostic tests (BIT) check the major ADCP modules and signal paths for reasonableness. If any BIT test is outside what would normally be considered reasonable (see the Test Guide), than check the following items:

- Turn off all other acoustic devices.
- Ensure that all monitors are at least 1 meter (3 feet) from the electronic chassis.
- The vessel is stopped.
- The vessel is in at least 3 meters of water below the transducer.
- No air is in front of the transducer.

2.3.1 Failure Scenario: PT3 Test Fails

The PT3 test is intended to confirm the presence of externally and internally generated interference terms. This test does not send any transmit pulse. This test only checks the receive path circuitry for the energy from signals. If there is energy then a failure condition will occur in this test. This test may also fail if there is a problem with the receive circuitry from the transducer assembly to the electronics chassis. Therefore, if a failure of the PT3 test occurs there are several additional tests that should be run to confirm whether this is an interference problem or if it is a hardware failure.

This test is designed to run with the transducer connected while it is in water. However, the test can also be run in air, with the transducer connected, or with the transducer disconnected. Running these tests in these different configurations does not cause the test to fail. This is because we are only looking for an interference term not the connectivity of all components. Therefore, you should know that a pass condition is possible in all of the following setups:

- The transducer is in water and connected to the electronics chassis through the cable.
- The transducer is in air and connected to the electronics chassis through the cable.
- The transducer cable only is connected to the electronics chassis.
- The electronics chassis has no transducer or transducer cable attached to it.

While it may seem odd that a pass condition is possible in all of the above setup conditions you must remember that this test is intended to only check for the possibility of interference. If there is no interference present then the test SHOULD pass in all of the above setups.

> **NOTE.** The 150kHz transducer is particularly susceptible to self-interference when the transducer is disconnected. PT3 may (or may not) fail in this condition. It is most important that PT3 passes with the transducer connected and in water. If it passes with it connected, but fails with it disconnected - don't worry about it.

Now, if this test does fail, then by testing the system in each of the above configurations you will be able to determine where the interference is coming into the system or where a hardware failure exists.

Possible failures: As stated the problem could be caused by either an externally generated interference term or as a problem in the hardware (electronics chassis, cable, or transducer).

Trouble-Shooting Process: Since a PT3 failure could be externally generated or by an internal failure we must first isolate the possibilities. Use the following steps in the order shown to be able to perform this isolation.

a. To check for an externally generated cause, you must turn off power to all other sensors and all non-required equipment and computers.

b. Run the PT3 test. If the test fails continue to step c. If the test passes then you have an externally generated signal and you need to discover which item is causing the interference. This can be done by incrementally turning on each piece of equipment and running the PT3 test until you find the offending device. If you cannot find any cause of the interference then skip to step i.

c. Turn off power to the ADCP.

d. Remove the transducer cable from the back of the electronics chassis.

e. Turn on power to the ADCP.

f. Run the PT3 test. If the test passes then skip to step g. If the test fails then go to step f1.

   1. Remove the chassis from the area you are testing and to a completely new location with a different AC power source. Run the PT3 test again. If the test still fails then the chassis has a problem and you need to return the electronics chassis to RDI for repair. If the test passes continue to step g.

g. Connect the transducer cable to the back of the electronics chassis and disconnect the transducer cable from the transducer.

h. Run the PT3 test. If the test passes then skip to step i. If the test fails then go to step h1.

1. The test suggests that the cable is the problem. The cable may have a problem in the wiring. You must run the end-to-end test shown in Table 5, page 30. If the test passes then continue with step i to confirm if the problem is externally generated or not.

i. At this point, the problem has been either isolated to the transducer or you have an externally generated interference term. To determine if this PT3 failure is a problem you should collect single ping beam data for at least one hour and send it to RDI for further review.

   We provide the following information for general outlines of how the data can be inspected to determine if there is really a problem in the system.

   1. You must review the data for reasonable echo intensity values and that it is free of spikes. Reasonable values will have the beginning of the profile start between 130-200 counts. At the end of the profile the echo intensity values should be between 10-50 counts. You will then want to review the echo data as a color contour plot (in *WinADCP*) to look for any spikes (high echo intensity values relative to the depth cells around it) that show a repeating pattern (see Figure 1, page 16). If there is a repeating pattern then you have external interference. Continue with step i2 to determine if you have bias from this interference.
   2. You must review the correlation data for signs of reduced correlation (less than 160 counts) in first 50% of the profile. You also need to review the area where you found echo intensity spikes for reduced (relative to the surrounding depth cells) correlation values. If the correlation is noticeably reduced you must contact RDI for further review of the data.
   3. You must review the vertical and error velocities for reasonableness. You will want to inspect them for unreasonable spikes (consistent spikes at the same depth cell on every ensemble, or spikes that match up with the echo intensity spikes), see Figure 2, page 17. If there are spikes then the interference is biasing your data. You must either find or disable the external system that is interfering or you must return the ADCP to RDI for repair.

2.3.2 Failure Scenario: PT6 Test Fails

The PT6 test is intended to confirm the proper impedance matching between the electronics chassis, the cable, and the transducer. This test does not send any transmit pulse. This test only checks the receive path circuitry for proper impedance matching. If the PT3 test fails then it is probable that this test will fail also. Therefore you should first troubleshoot the PT3 test failure and then check for the causes of the PT6 fail.

This test is designed to run with the transducer connected and in water. It can be run in air, with the transducer connected, or with the transducer disconnected. Running these tests in these different configurations does not cause the test to fail. This is because we are only looking for a proper impedance matching and not the connectivity of all components. Therefore, you should know that a pass condition is possible in all of the following setups:

- The transducer is in water and connected to the electronics chassis through the cable.
- The transducer is in air and connected to the electronics chassis through the cable.
- The transducer cable only is connected to the electronics chassis.
- The electronics chassis has no transducer or transducer cable attached to it.

If this test does fail then by testing the system in the above configurations will allow you to determine where the interference is coming into the system or where a hardware failure may exist.

> **NOTE.** The 150kHz transducer is particularly susceptible to self-interference when the transducer is disconnected. PT3 and PT6 may (or may not) fail in this condition. It is most important that PT3 and PT6 pass with the transducer connected and in water. If it passes with it connected, but fails with it disconnected - don't worry about it.

Possible failures: This problem could be caused by an external interference term or as a problem in the hardware (electronics chassis, cable, or transducer).

Trouble-Shooting Process: Since a PT6 failure could be caused by an externally generated interference term you must first check the PT3 test for failures. If PT3 passes or you have run the PT3 checks then use the following steps to determine the cause of the PT6 failure.

a. Turn off power to the ADCP.

b. Remove the transducer cable from the back of the electronics chassis.

c. Turn on power to the ADCP.

d. Run the PT6 test. If the test passes then skip to step e. If the test fails then there is a problem with the chassis and it must be returned to RDI for repair.

e. Turn off power to the ADCP.

f. Connect the transducer cable to the back of the electronics chassis and disconnect the transducer cable from the transducer.

g. Run the PT6 test. If the test passes then skip to step h. If the test fails then the problem is in the cable and you need to perform the cable resistance checks in Table 5, page 30.

h. If all of the previous tests have passed then you have confirmed the problem is in the transducer and you need to contact RDI for return and repair of the transducer.

2.4 Troubleshooting a Beam Failure

Failure Scenario: One or more beams are showing near zero and flat returns on echo intensity.

Background: The echo intensity values represent the relative signal strength along each beam at each of the depth cells. The echo intensity values normally start between 130-180 counts and will end (assuming you are collecting data to the end of the profiling range) at 10-40 counts.

If a beam is not returning signals, then it will not be collecting data. The result is that if only one beam is showing low echo returns then the ADCP will perform three beam solutions. If more than two beams are showing low echo returns then the ADCP will not be able to collect any data.

Possible failures: (Refer to Figure 3, page 17 through Figure 5, page 19)

- Typically, if the echo intensity data is indicating low returns so will the correlation data. If the correlation data looks acceptable while the echo intensity is low, then this indicates a problem on the receive side only and not on the transmit side. This could be a problem within the transducer wiring, the transducer Beam Former board, the transducer to electronics chassis cable, or the electronics chassis.
- If the echo intensity and the correlation data is indicating low returns on all four beams then this is most likely a problem with the transmit circuitry or the transducer Beam Former board.

Trouble-Shooting Process:

a. Run the PT tests and check for failures. If there are failures then use the troubleshooting listed for these failures to isolate the likely components.

b. If there are no PT failures associated with this failure, then you must unplug the cable from the back of the chassis and collect data with the same setup you were using. All four beams should produce no echo intensity or correlation returns. If the results of the four beams do not look the same then it is likely that there is a problem in the electronics.

c. If no change in the results occurred during step b then you must run the resistance checks in Table 4, page 29. Disconnect the transducer cable from the back of the electronics chassis. Using a meter confirm that the resistances in Table 4, page 29 columns 2 and 3 (titled Cable Dry Connector) are valid. If they PASS then proceed to step e. If they FAIL then proceed to step d.

d. Gain access to the Transducer bulkhead connector and remove the cable from the connector. Using a meter confirm that the resistances in Table 4, page 29 columns 4 and 5 (titled XDCR Wet Connector) are valid. If they FAIL then the transducer has failed and must be returned to RDI.

e. If step c and/or step d PASS then you are unable to confirm which part has actually failed and you must return the entire ADCP to RDI.

2.5 Troubleshooting Data Problems

Failure Scenario: Range is limited and the echo intensity values at the end of the profile are higher than 50 counts.

The echo intensity values represent the relative signal strength along each beam at each of the depth cells. The echo intensity values normally start between 130-180 counts and will end (assuming you are collecting data to the end of the profiling range) at 10-40 counts.

If the echo intensity values at the end of range are greater than 40 counts, then the background noise is much higher than expected. This raised background noise will reduce the signal to noise ratio and result in a loss in range.

Each echo intensity value has a rough value of 0.5 dB. For every two counts of increase in the background noise there is a 1dB increase in noise. A generally excepted rule of thumb is that for every dB of increase in the background noise at the end of profiling range there will be a loss of one default depth cell in range (150kHz = 8meters, 75kHz=16meters, and 38kHz=32meters).

Possible failures: (Refer to Figure 3, page 17 through Figure 6, page 19)

- The background noise is typically the result of externally generated signals, such as the operation of thrusters on an oil platform, the prop on a vessel, or the flow of water across the transducer when traveling at speed on a vessel.
- It is also possible for other sonar devices to increase the background noise floor.
- And finally, a failure in the electronics chassis, cable, or beam former can cause an increase in the Background noise.

Trouble-Shooting Process: Run all PT tests. If there area any failures follow the troubleshooting section to locate the fault. If there are no faults then go to step b.

a. Since the common causes of this issue is related to external generated noise, it is recommended that you unplug power to the electronics chassis and remove the transducer cable. You should operate the system just as you had. The echo intensity values you should get in this setup should be consistently <40 counts for the entire profile on all four beams. If it is elevated then the electronics chassis has failed and needs to be repaired. If it passes then go to step b.

b. At this point the raised noise floor is most likely not in the ADCP, but the only way to confirm this would be to either to have the thrusters turned off, the vessel slowed down, or to turn off all other equipment to confirm. As this may not be possible, the only thing to do would be to check the resistances in both Table 4, page 29 and Table 5, page 30 to confirm that there is no other possible failure.

   If these tests PASS then the problem is most likely generated from external signals and there is no solution other than to lower the ADCP farther away from the thrusters or to place a window in front of the transducer. If these have been tried without success then send a set of single ping beam data to the RDI Field Service department for them to inspect the results and to provide you with the best coarse of action to take.

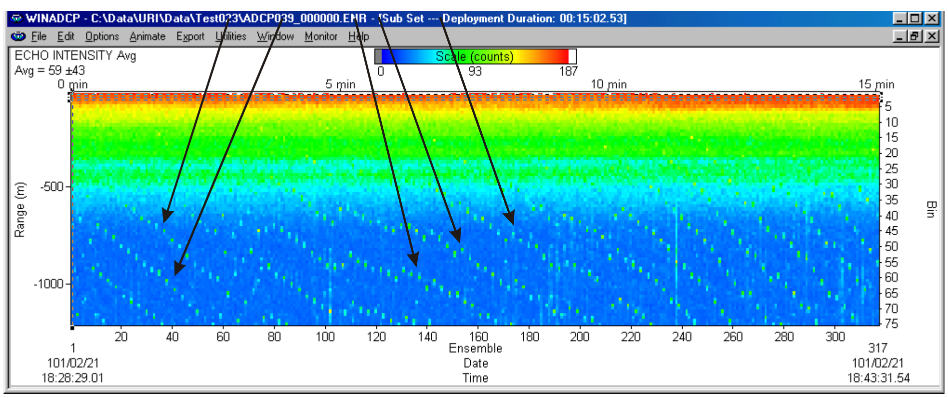


Figure 1. Repeating Pattern of Interference Terms in the Echo Intensity Contour Plot

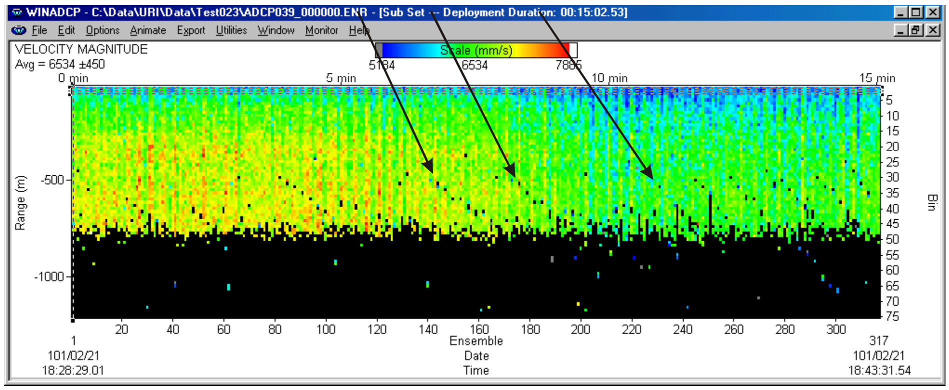


Figure 2. Repeating Pattern of Interference Terms in the Horizontal Magnitude

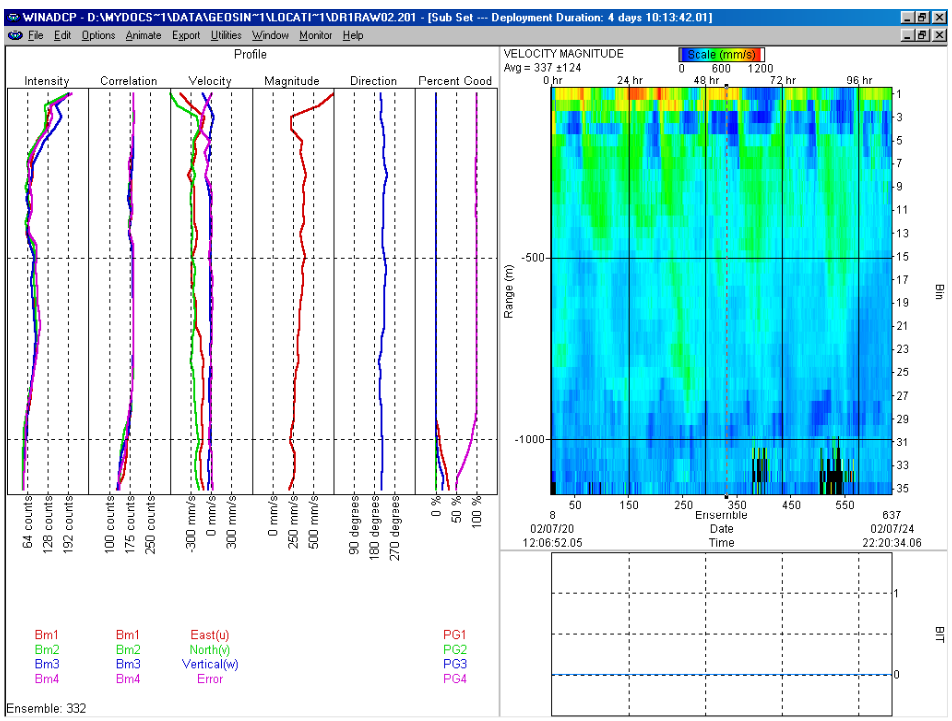


Figure 3. Expected Output Levels for Ocean Observer in NB Mode

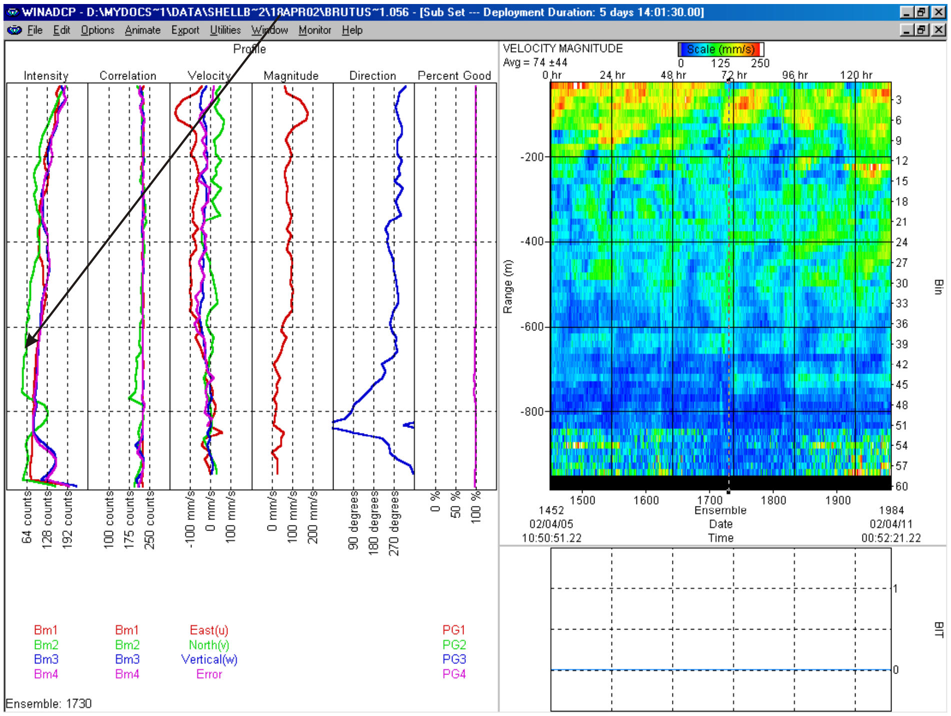


Figure 4. Weak Returns on a Single Beam (Beam 2) for Ocean Observer in BB Mode

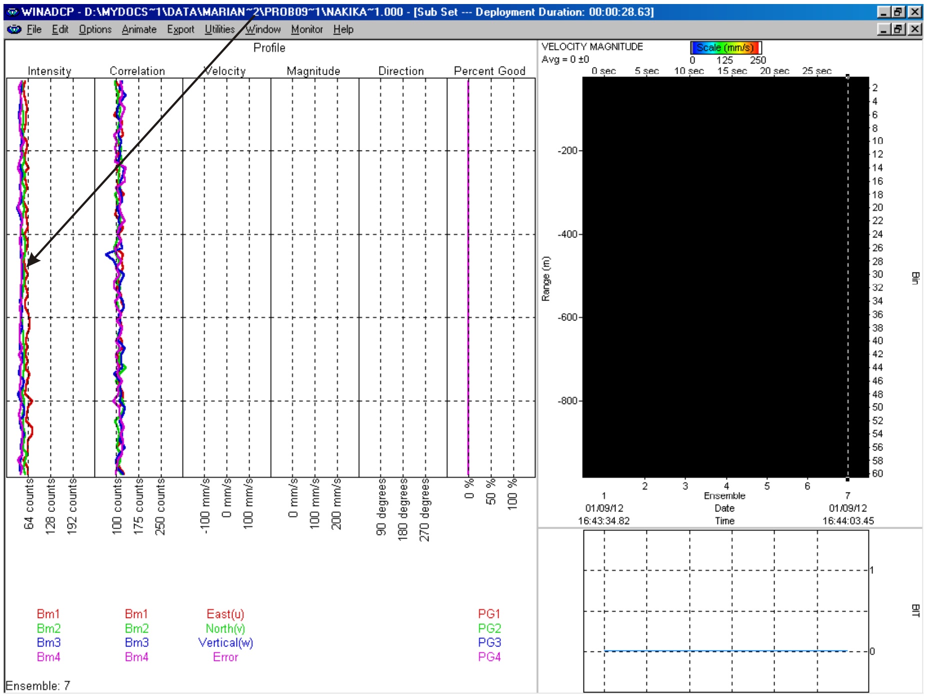


Figure 5. Weak Returns on all Four Beams for Ocean Observer in BB Mode

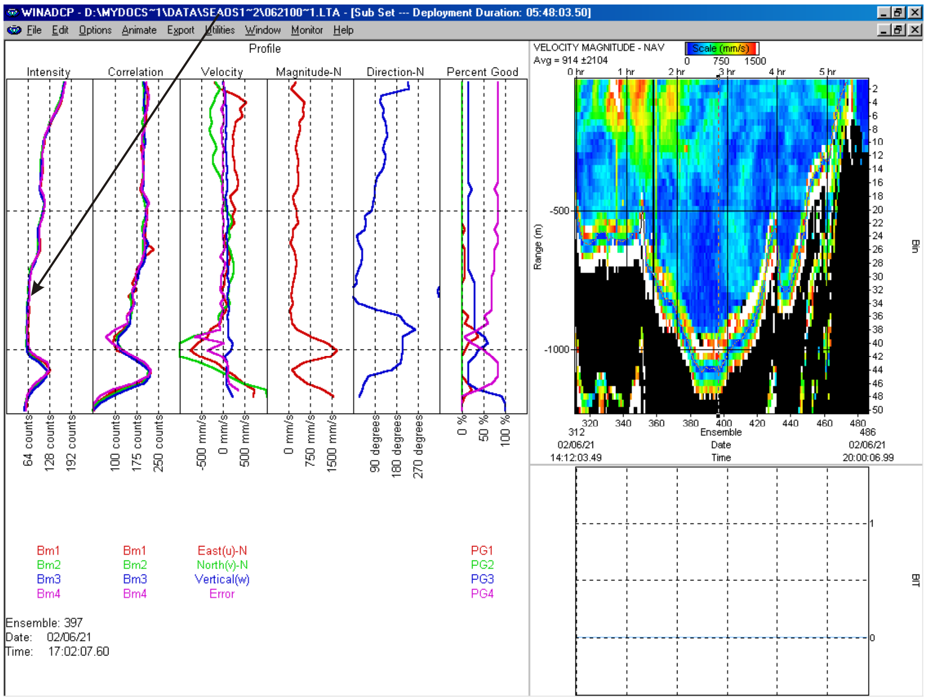


Figure 6. Range Limited at the Noise Floor for Ocean Surveyor in BB Mode

2.6 Troubleshooting a Sensor Failure

Run the PC2 test to isolate the problem. The temperature sensor is imbedded in the transducer head, and is used for water temperature reading. The displayed Heading, Pitch, and Roll sensor data source is set according to the selection via the EZ command. Please refer to the Command and Output Data Format guide for more details on using the EZ command.

An open temperature sensor connection would approximately indicate the counts and degrees as given in the example below. A shorted temperature sensor or connection would indicate approximately 92 °C.

```
>PC2
Heading      Pitch      Roll        Temperature
 (int)       (int)      (int)       cts    degs
 000.0       +00.0      +00.0       0FF6   -36.3
 000.0       +00.0      +00.0       0FF5   -36.2
>
```

NOTE. If the temperature sensor is bad, the data can still be collected without effecting the accuracy or quality. Contact RDI about scheduling the repair of the temperature sensor at your convenience.

For External Sensor verification, see the Test Guide and the Installation Guide. If the external gyro is not working, see the Installation guide for troubleshooting information.

Fault Log

To determine why a sensor failed, view the fault log. To view the fault log, start *BBTalk*. Press the **End** key to wakeup the ADCP. Send the following commands: **CR1**, **PC2**, **LD**. The LD-command displays the fault log.

```
[BREAK Wakeup A]

Ocean Surveyor Broadband/Narrowband ADCP
RD INSTRUMENTS (c) 1997-2000
ALL RIGHTS RESERVED
Firmware Version 23.xx
>
>CR1
>PC2
|          (PC2 test results (not shown))
|
>LD
Time of first fault:    2000/08/23,10:08:13
Overflow count:              0

Fault Log:
     Code             Count           Time                 Parameter
506  TEMP RANGE          3       2000/08/23,10:08:22       FFFFF1D7h
203     RTC CAL          2       2000/08/23,10:08:19       00000001h

End of fault log.

>
```

NOTE. The LL command displays a list of different faults that can be recorded in the fault log.

2.7 Troubleshooting the TCM2 Compass

Failure Scenario: TCM2 Compass Not Detected – an error message is displayed.

The Ocean Observer is intended for installations on oil platforms. The configuration of the Ocean Observer transducer includes an internal TCM2 compass as part of its factory build. The compass is used to provide heading, pitch, and roll information. This compass is a flux gate compass and therefore is biased by magnetic fields. As a result, the TCM2 compass is *not* included in the Ocean Surveyor (which is intended for vessel mount installations).

To utilize this compass the electronics chassis must first be configured to detect the TCM2 compass whenever a break signal is sent to the electronics chassis. The electronics chassis is configured to detect TCM2 compass at the factory, but it can be changed in the field.

Power is supplied to the compass from the electronics chassis. Communications between the TCM2 compass and the electronic chassis is done through an RS232 link at 38400-baud, no parity, and 8 data bits. The TCM2 compass is read at the start of each ping and the readings of the heading, pitch, roll data are stored in the ADCP variable leader data.

Possible failures:

- The system is configured incorrectly and is trying to detect the TCM2 compass when it should not.
- The transducer cable to electronics chassis is not connected, or has a broken or shorted wire.
- The cable inside the transducer assembly between the end cap and the TCM2 compass is not connected, or has a broken or shorted wire.
- The TCM2 compass power and/or communications circuitry in the electronics chassis Motherboard has failed.
- The TCM2 compass has failed inside the transducer.

Trouble-Shooting Process:

a. If you have an Ocean Observer skip to step b. If you have an Ocean Surveyor and you are receiving this error message, then the chassis has not been configured properly and you need to do the following:

   1. Type @C – The ADCP will respond with a configuration list. You will want to ensure that both the TCM2 Detect is DISABLED and that the Platform is set to SHIP. If they are not set properly then follow steps 2 through 5 to set them properly.

2. Type D to access the TCM2 configuration.
3. Type 0 to disable the TCM2 compass.
4. Type P to access the Platform configuration.
5. Type 0 for Ship configuration.
6. Type 1 to Save and Exit.
7. After the wake up message appears the system has been configured properly.

```
>@C
WARNING:  Changing system configuration may affect performance!
          Know and understand the consequences before changing
          any settings.

System Configuration Menu

     0    Exit without Saving
     1    Save and Exit
     B    Beam Former Rev       A02 or later
     D    TCM/2 Detect          DISABLED
     O    Test Port             DISABLED
     P    Platform              SHIP
     S    Synchro Detect        ENABLED
     X    Transducer Type       ROUND 36x36
     ?    Display Menu
% 1

System Config saved to FLASH
```

b. There are four connections to the TCM2 board that are required for the TCM2 compass to work properly. These are power, ground, RS232 in, and RS232 out. A bent pin or poor connection at the back of the chassis can cause one or more of these connections to be bad. Confirm that the transducer cable connector is seated properly at the electronics chassis.

   If the connector cable is seated properly, then you will need to confirm that the connections through the cable (from the electronics chassis to the transducer) are good. The first check will be to determine if the resistances measured at the dry end cable connector are good. If they are not good, then you will have to check the resistances at the transducer bulkhead connector. If they are good there then the problem is in the cable and now you need to check the resistance from end to end on the transducer cable. Use these steps to perform these checks.

   1. Disconnect the transducer cable from the back of the electronics chassis. Using a meter to measure resistance confirm that the resistances in Table 4, page 29 columns 2 and 3 (titled Cable Dry Connector) are valid. If they PASS then proceed to step c, if not then continue to step b2.
   2. Gain access to the Transducer bulkhead connector and remove the cable from the connector. Using a meter to measure resistance confirm that the resistances in Table 4, page 29 columns 4 and 5 (titled

XDCR Wet Connector) are valid. If they PASS then proceed to step b3.

3. If step b1 and step b2 pass then you should go to step c. If step b1 failed, but step b2 passed then the fault is in the transducer to electronics chassis cable. To confirm the fault in the cable perform the end-to-end resistance checks in Table 5, page 30. If the cable checks out good then the redo the tests in step b1.

c. At this point we have confirmed that all of the connections from the back of the electronics chassis to the TCM2 board inside the transducer are good. This leaves us with either a hardware fault in the electronics chassis or on the TCM2 board itself.

   If the electronics chassis circuitry is found to be functioning properly then the TCM2 board inside the transducer has failed and needs to be repaired or replaced. See the Maintenance Guide on how to gain access to the TCM2 board.

   If the electronic chassis circuitry is found to be non-functional then the electronics chassis must be repaired at the RDI factory.

   In the mean time, it will be necessary to test the TCM2 board again after the electronics chassis has been repaired or to return it with the electronics chassis for inspection and repair.

   The following steps will confirm if the electronics chassis is working properly.

1. Turn off power to the electronics chassis.

2. Remove the electronics to transducer cable from the back of the electronics chassis.

3. We want to make sure that there is power available to the TCM2 board. Place the leads from a DC voltmeter between pins U (VDC +) and T (VDC -) on the connector J1 on the back of the electronics chassis.

4. Turn on power to the electronics chassis. You should measure between 11.5 – 12.5VDC. If this is correct, then go to step c5. If this voltage is not correct, then the electronics chassis must be returned to RD Instruments for repair.

5. Turn off power to the electronics chassis.

6. We now want to confirm that the TCM2 RS232 circuitry in the electronics chassis is working properly. You will want to use a wire (a paper clip works well) to short pins k and m off J1 connector on the back of the chassis.

7. Connect the electronics chassis serial connector to the computer.

8. Start up the RDI *BBTalk* program. Configure the program for communications to the electronics chassis.
9. Turn on power to the electronics chassis. The wake up message should appear on the screen.
10. Type the command &M9. The TCM2 terminal mode is now active.
11. Type any letter or number character on your keyboard. The keys you type should be echoed on the screen. If the keys are echoed then the RS232 TCM2 circuitry is working properly and the TCM2 board requires repair. If the keys are not echoed then the electronics chassis must be returned to RDI for repair.

NOTE. If you have determined that the electronics chassis is not working then you may have still have a bad TCM2 board. Currently, there is no way to confirm if the TCM2 board is functioning properly without the chassis. RDI will be creating a special testing fixture that will allow you to test the TCM2 board at the transducer connector and at the TCM2 board itself to check for proper operation.

2.8 Troubleshooting Software Problems

The computer requirements change depending of the number of COM port, baud rate, and refresh rate is used (see the Installation Guide for computer requirements). The symptoms that the computer is struggling to process the data are:

- The computer shows the message “lost ensemble” when you use the keyboard.
- The computer shows the message “lost ensemble” when you change the display from *VmDas* to *WinADCP*.
- Repetitive errors are found in the .log file

Example

```
[2001/07/24, 10:47:12.385]: NMEA [RPH] serial buffer level OK.

[2001/07/24, 10:47:36.259]: NMEA [RPH] serial buffer full: Storing 300 bytes
without processing.

[2001/07/24, 10:47:36.259]: NMEA [RPH] serial buffer level OK.

[2001/07/24, 10:47:40.275]: NMEA [RPH] serial buffer full: Storing 300 bytes
without processing.

[2001/07/24, 10:47:40.275]: NMEA [RPH] serial buffer level OK.

[2001/07/24, 10:47:43.289]: NMEA [RPH] serial buffer full: Storing 300 bytes
without processing.

[2001/07/24, 10:47:43.289]: NMEA [RPH] serial buffer level OK.
```

To correct "lost ensemble" problems it may be necessary to upgrade the computer you are using. We recommend the following:

- A good quality video card is required to operate *VmDas* and *WinADCP* simultaneously. We do not use graphic card 3D functions, however, video memory is needed to display all graphics.
- If you are using more than two communication ports, you should not use a Celeron processor.
- Intel Pentium III processors work best to operate the ADCP and give access to display and keyboard without losing ensembles.

2.9 Technical Support

If you have technical problems with your instrument, contact our field service group in any of the following ways:

RD Instruments
9855 Businesspark Ave.
San Diego, California 92131
(858) 693-1178
FAX (858) 695-1459
rdifs@rdinstruments.com

RD Instruments Europe
5 Avenue Hector Pintus
06610 La Gaude, France
+33(0) 492-110-930
+33(0) 492-110-931
rdifs@rdieurope.com

Web: http://www.rdinstruments.com

The industry leader in Customer Support has just raised the bar another notch. RD Instruments introduces the After-Hours Emergency Service. When the RDI-US and RDI-Europe office is closed, customers may now call +1 858-578-0781 to have their after-hours emergencies resolved.

If your instrument works and you have questions involving a specific application, you may call either the field service group (above) or our sales/marketing staff.

3 Ocean Surveyor Cables

This section provides information on Ocean Surveyor cabling. Special user-requests may cause changes to the basic wiring system and may not be shown here. We provide these drawings only as a guide in troubleshooting the ADCP. If you feel there is a conflict, contact RDI for specific information about your system. Where shown, the color code is for reference only; your cable may be different. The following figures show various Ocean Surveyor cable locations, connectors, and pin-outs.

3.1 Transducer to Electronic Chassis I/O Cable

Cable specifications:

- Minimum bend radius = 203 mm (8.0 in.)
- Typical cable OD = 19.8 mm (0.78 in.)
- Maximum pull load = 1132 N (250 lb.)
- Maximum length = 100 m (328 ft.)
- Available with either ends having straight or angled connectors or a combination thereof.

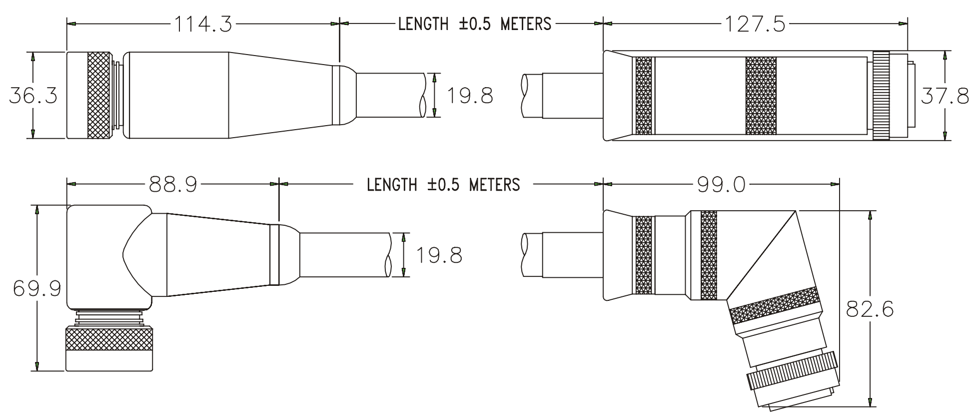


Figure 7. External I/O Cable

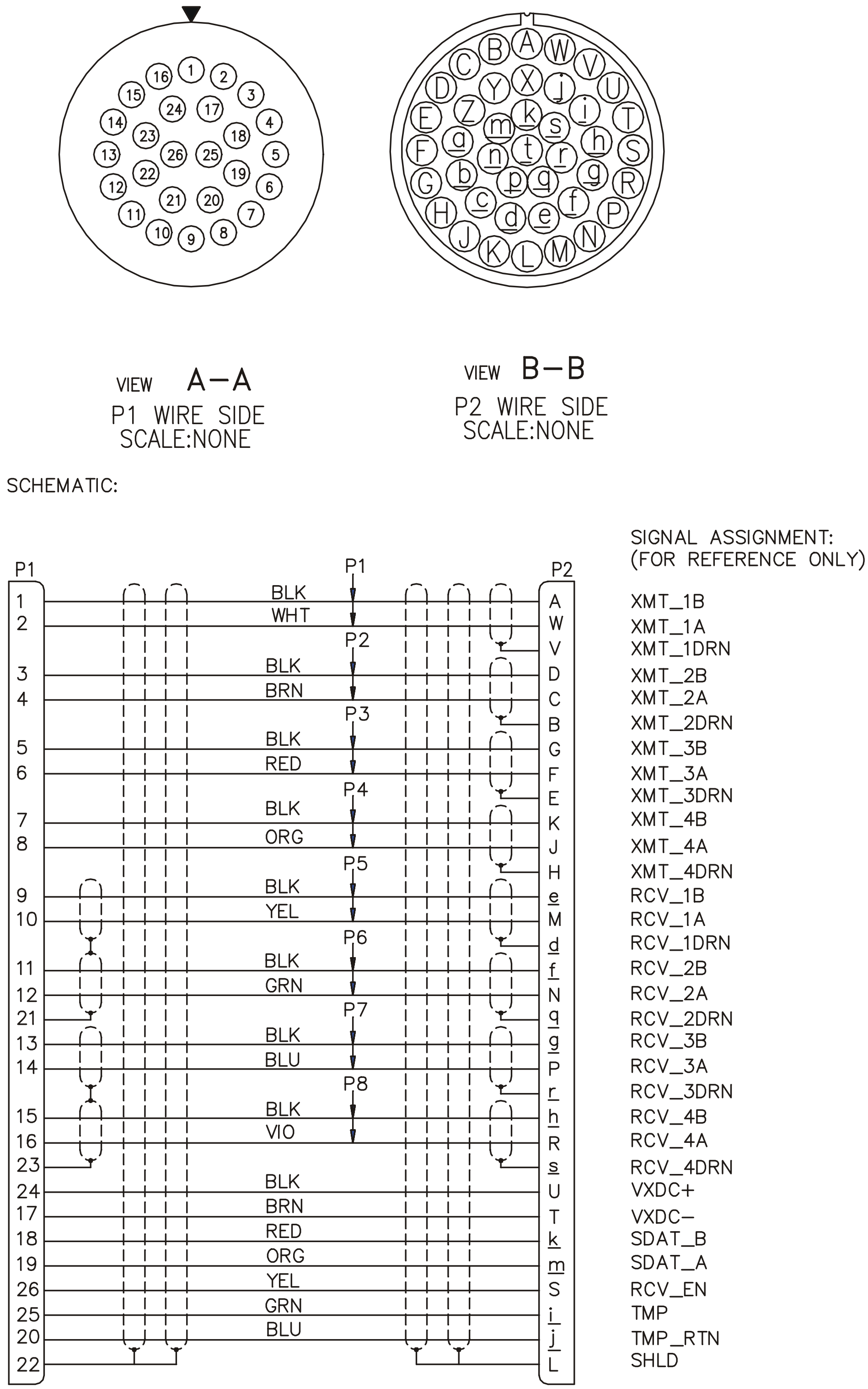


Figure 8. External I/O Cable Wiring (Drawing Number 73A-6010)

3.2 Checking the Transducer I/O Cable

For checking the Transducer cable, it is recommended that both ends of the cable are disconnected and accessible. You must take care not to bend or otherwise damage any pins or sockets. Do not allow debris or moisture to enter the contact or O-ring surfaces of the connectors. While performing the continuity check, it provides the opportunity to verify the integrity of the o-ring on the under-water mating connectors. Use silicon DC-111 O-ring grease for lubricating the O-ring and O-ring grooves.

Use the schematic diagram in Figure 8, page 27 to check the continuity of the transducer cable. Verify the pin-to-pin connections as indicated in the schematic; each connection should have continuity, where the resistance should nominally be 0.033 Ohms per meter of cable length at 20 °C (i.e., a 30 meter cable has a nominal conductor resistance of 1 Ohm at 20 °C). The isolation resistance between conductors, and conductors and shields should be at least 20 MOhm at 100 VDC. Note that if moisture is present you may not be able to obtain this isolation resistance.

When only the dry-side connector P2 (Electronics Chassis connector) is accessible and the transducer is connected to the underwater connector P1 (Transducer connector), use Table 4, page 29 for a coarse check of the transducer cable's integrity. Use a DMM for measuring the resistance.

CAUTION. Do **NOT** use a Hi-Pot Tester for measuring the resistance values, as serious damage to the transducer electronics will be the result.

NOTE. When the transducer cable is connected to the transducer, you are not able to differentiate between a problem that may exist in the cable or the transducer. That is, if you measure an open connection, the open may be in the cable or the transducer.

CAUTION. You must observe anti-static precautions for this test if the cable is connected to the transducer.

NOTE: Table 4, page 29 is valid for an Ocean Surveyor/Ocean Observer Transducer connected and a 30 meter cable length. Other cable lengths may be interpolated. Resistance values are valid at 20 °C.

Table 4: Transducer I/O Cable Wiring Resistance Check

Description	Cable Dry Connector		XDCR Wet Connector		Resistance
	From	To	From	To	
BEAM 1 XMIT to XMIT RTN	A	W	1	2	> 4.5 Mohms
BEAM 2 XMIT to XMIT RTN	D	C	3	4	> 4.5 Mohms
BEAM 3 XMIT to XMIT RTN	G	F	5	6	> 4.5 Mohms
BEAM 4 XMIT to XMIT RTN	K	J	7	8	> 4.5 Mohms
BEAM 1 RCV HI to BEAM 1 RCV LOW	e	M	g	10	< 15 ohms
BEAM 2 RCV HI to BEAM 2 RCV LOW	f	N	11	12	< 15 ohms
BEAM 3 RCV HI to BEAM 3 RCV LOW	g	P	13	14	<15 ohms
BEAM 4 RCV HI to BEAM 4 RCV LOW	h	R	15	16	<15 ohms
SHIELD to SHIELD	d	q	N/A	N/A	< 5 ohms
SHIELD to SHIELD	r	s	N/A	N/A	< 5 ohms
SHIELD to SHIELD	d	r	21	23	> 20 Mohms
RCV ENABLE to VXDC GND	S	T	26	17	4.7 kohms
TEMP to TEMP RTN	i	j	25	20	11.3 kohms
VXDC to VXDC GND	U	T	24	17	180 kohms
SDAT B to VXDC GND	k	T	18	17	5.9 kohms
SDAT A to VXDC GND	m	T	19	17	> 20 Mohms
SHIELD to ALL	B	ALL	N/A	N/A	> 20 Mohms
SHIELD to ALL	E	ALL	N/A	N/A	> 20 Mohms
SHIELD to ALL	H	ALL	N/A	N/A	> 20 Mohms
SHIELD to ALL	V	ALL	N/A	N/A	> 20 Mohms

Troubleshooting Tips:

1. N/A = Not applicable, no check possible.
2. Some meters will read as OPEN for resistances greater than 2Mohms - this is a pass.
3. If the TCM2 voltages are not present then only the compass will stop working. The system will still be able to collect profile data.
4. If any one of the transmit wires are not correct then the system will NOT function correctly and MUST be repaired before accurate current data can be collected.
5. If one of the receive wires are not correct then depending on the failure the system may still be able to function properly with 3 beam solutions.

Table 5: I/O Cable End to End Cable Resistance Check

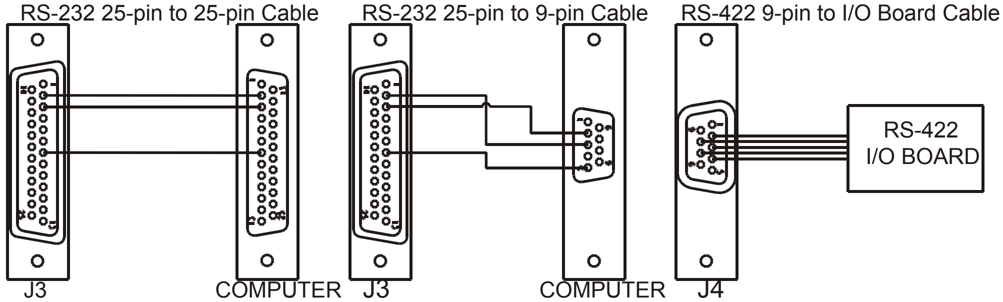
Description	Cable Wet Connector	Cable Dry Connector	Resistance
Beam 1 XMIT	1	A	<200 ohms
Beam 1 XMIT Return	2	W	<200 ohms
Beam 1 XMIT Shield	N/C	V	<200 ohms
Beam 2 XMIT	3	D	<200 ohms
Beam 2 XMIT Return	4	C	<200 ohms
Beam 2 XMIT Shield	N/C	B	<200 ohms
Beam 3 XMIT	5	G	<200 ohms
Beam 3 XMIT Return	6	F	<200 ohms
Beam 3 XMIT Shield	N/C	E	<200 ohms
Beam 4 XMIT	7	K	<200 ohms
Beam 4 XMIT Return	8	J	<200 ohms
Beam 4 XMIT Shield	N/C	H	<200 ohms
Beam 1 RCV Hi	9	e	<200 ohms
Beam 1 RCV Low	10	M	<200 ohms
Beam 1 RCV Shield	21	d	<200 ohms
Beam 2 RCV Hi	11	f	<200 ohms
Beam 2 RCV Low	12	N	<200 ohms
Beam 2 RCV Shield	21	q	<200 ohms
Beam 3 RCV Hi	13	g	<200 ohms
Beam 3 RCV Low	14	P	<200 ohms
Beam 3 RCV Shield	23	r	<200 ohms
Beam 4 RCV Hi	15	h	<200 ohms
Beam 4 RCV Low	16	R	<200 ohms
Beam 4 RCV Shield	23	s	<200 ohms
TCM/2 VDC +12VDC	24	U	<200 ohms
TCM/2 VDC GND	17	T	<200 ohms
TCM/2 RS232 IN	18	k	<200 ohms
TCM/2 RS232 OUT	19	m	<200 ohms
RCV Enable	26	S	<200 ohms
Temperature	25	i	<200 ohms
Temperature RTN.	20	j	<200 ohms
Overall Shield	22	L	<200 ohms

Troubleshooting Tips:

1. If the TCM/2 voltages are not present then only the compass will stop working. The system will still be able to collect profile data.
2. If any one of the transmit wires are not correct then the system will NOT function correctly and MUST be repaired before accurate current data can be collected.
3. If one of the receive wires are not correct then depending on the failure the system may still be able to function properly with 3 beam solutions.

3.1 Serial Data Communications Cables

The provided wiring diagrams and pin-out descriptions of Figure 9 provide the information necessary to connect your host computer to the Ocean Surveyor Electronics Chassis with a minimum of conductors. Off-the-shelf cables may provide more than these minimum connections, but must follow as a minimum the schematics depict in Figure 9. Connectors J3 and J4 are located at the rear panel of the Electronics Chassis, and are used for RS-232 or RS-422 communication respective. Both, RS-232 and RS-422 interfaces are isolated.



Cable Type	ADCP Signal	Chassis	Computer	Computer Signal
RS-232 25-pin to 25-pin	DATA IN DATA OUT GND	2 3 7	2 3 7	DATA OUT DATA IN GND
RS-232 25-pin to 9-pin	DATA IN DATA OUT GND	2 3 7	3 2 5	DATA OUT DATA IN GND
RS-422 9-pin to I/O board	DATA IN A DATA OUT A COMMON DATA IN B DATA OUT B	2 4 3 7 8	- - - - -	DATA OUT A (+) DATA IN A (+) COMMON DATA OUT B (-) DATA IN B (-)

NOTE: These cables provides RS-232 or RS-422 communications. Two cables are provided with the instrument: (1) 25-pin to 25-pin RS-232 cable, and (1) 25-pin to 9-pin RS-232 cable. Each cable is about 2-meters long and has a diameter of 8 mm (0.31 in.). For cable lengths longer than 15 meters, we recommend you use RS-422 communications. The cable for RS-422 communication is not provided with the equipment.

Figure 9. Serial Communication Cable Wiring Diagram

4 System Overview

This section presents a functional description of the Ocean Surveyor's operation using block diagrams.

4.1 Overview of Normal Ocean Surveyor Operation

The following events occur during a typical data collection cycle.

a. The user or a controlling software program sends setup and data collection parameters to the Ocean Surveyor. The user/program then sends a CS-command to start the data collection cycle. The firmware program stored in the CPU microprocessor takes control of Ocean Surveyor operation based on the commands received through the serial I/O cable.

b. The Ocean Surveyor Motherboard generates all transmit signals for driving the Quad Transmitter circuit, located on the Power Assembly board. The Transmitter drives the transducer, which projects the acoustic energy into four narrow and directed water columns. Unlike conventional multi beam transducers, these four beams in the Ocean Surveyor are generated during transmit via the transmitter signal phase relationships, and not by separate acoustic projectors.

c. Most backscatter from the water column is generated by zooplankton. The transducer receives echoes from the backscatter. The four receive beams are formed by the Beam Former inside the Transducer assembly. The formed and amplified signals of the four beams are fed to the Electronics Chassis via the Transducer Cable.

d. The Motherboard carries the four receiver channels necessary for amplifying, decoding, and filtering the four beam signals formed by the Beam Former.

e. The filtered signals are then sampled, along with the echo intensity signal, and processed by the Motherboard's Digital Signal processor (DSP).

f. The Thermistor measures the water temperature at the transducer head and sends it to the motherboard.

g. The TCM2 compass located inside the Transducer assembly (Ocean Observer), or Gyro Interface board (Ocean Surveyor) sends pitch and roll from the tilt sensor and heading from the compass to the Motherboard.

h. The system repeats steps "b" through "g" for a user-defined number of pings. The Motherboard averages the data from each ping to produce an ensemble data set.

i. At the end of the ensemble (sampling) interval, the Motherboard sends the collected data to the serial I/O connector.

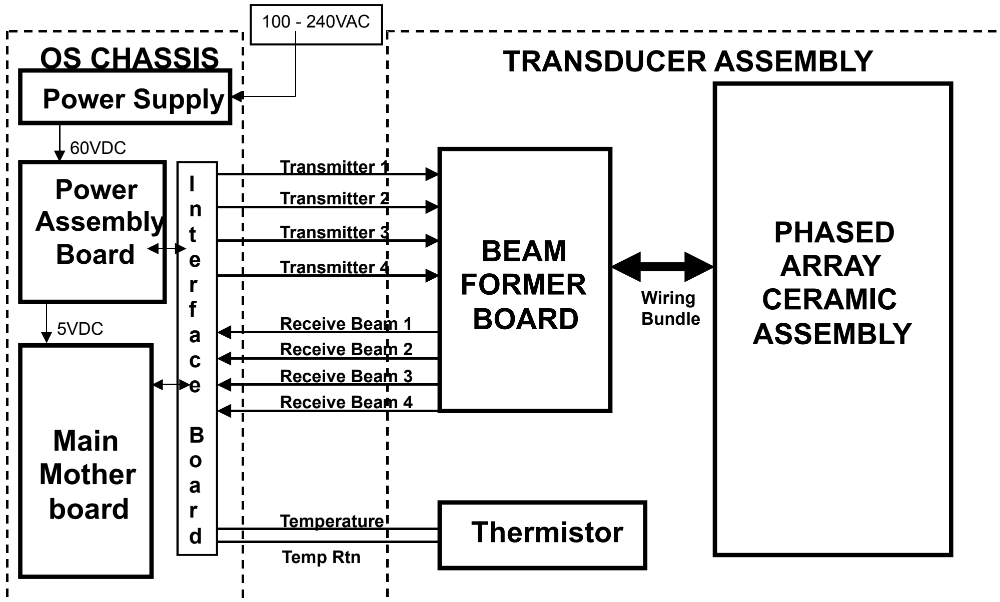


Figure 10. Ocean Surveyor Block Diagram

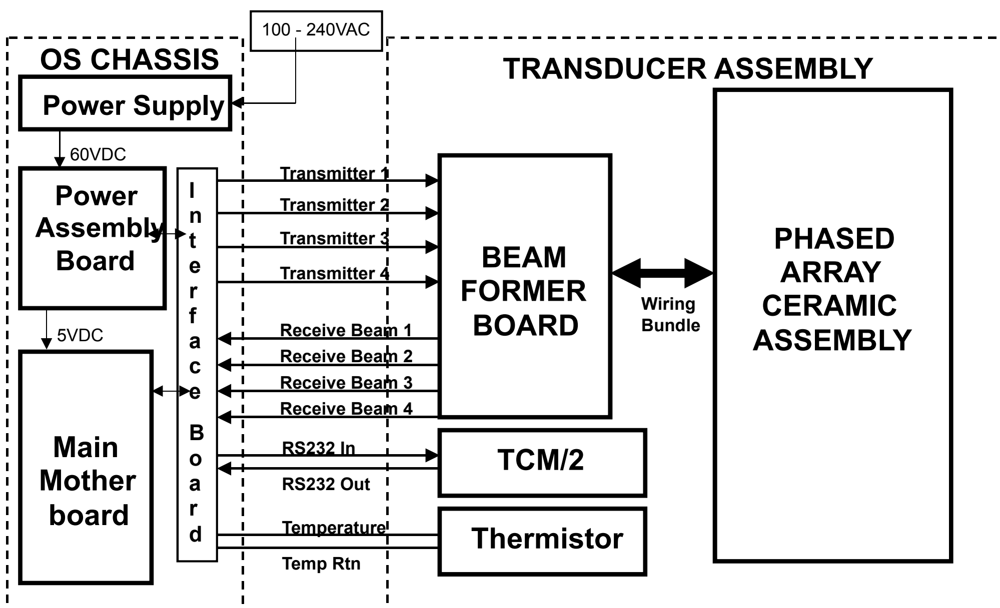


Figure 11. Ocean Observer Block Diagram

4.2 Functional Description of Operation

The following sections describe how the Ocean Surveyor operates and interacts with its modules.

4.2.1 Input Power

The Ocean Surveyor Electronic Chassis requires a supply between 90 and 250 V~, and 47 – 63 Hz. A list of pertinent power specification is listed for reference in Table 6.

Table 6: Ocean Surveyor Input Power Requirements.

Input Characteristics	Specification
Mains input voltage range	90 - 250 Vac, 47 - 63 Hz
Mains power between transmit	60 VA
Mains power during transmit	1400 VA
Peak Mains power during transmit	2000 VA (for 4 or less Mains cycles)
Inrush current[1]	17 A rms @ 115 Vac
	34 A rms @ 230 Vac
Ride through time[1]	20 ms
Transient surge[1]	EN/IEC 1000-4-2 Level 4
(Common mode & Normal mode)[1]	EN/IEC 1000-4-5 Level 3

[1] Obtained from the power supply manufacturer data sheet.

The power supply generates a single 48 VDC supply voltage. It is fed to the Power Assembly. The Power Assembly consists of the Quad Transmitter, a 5-volt DC/DC converter for the Electronics Chassis's supply, a 12-volt DC/DC converter for the transducer supply, and the 10 VDC Transmitter gate drive supply. The 48 VDC is also the supply for the transmitter. A single replaceable fuse protects the system from shorts in the transmitter. Self-resetting fuses protect all other supplies.

4.2.2 Board Descriptions

Power Assembly Board.

- Receives the filtered/internal power.
- Limits the in-rush of current to the Ocean Surveyor and provides over and negative-voltage protection. Either condition will blow a protective fuse. However, damage could occur to other circuits before the fuse blows. Please ensure you apply voltages within the specified range (85 to 264 VAC).
- Converts the operating power supply voltage to power all other Ocean Surveyor circuits.

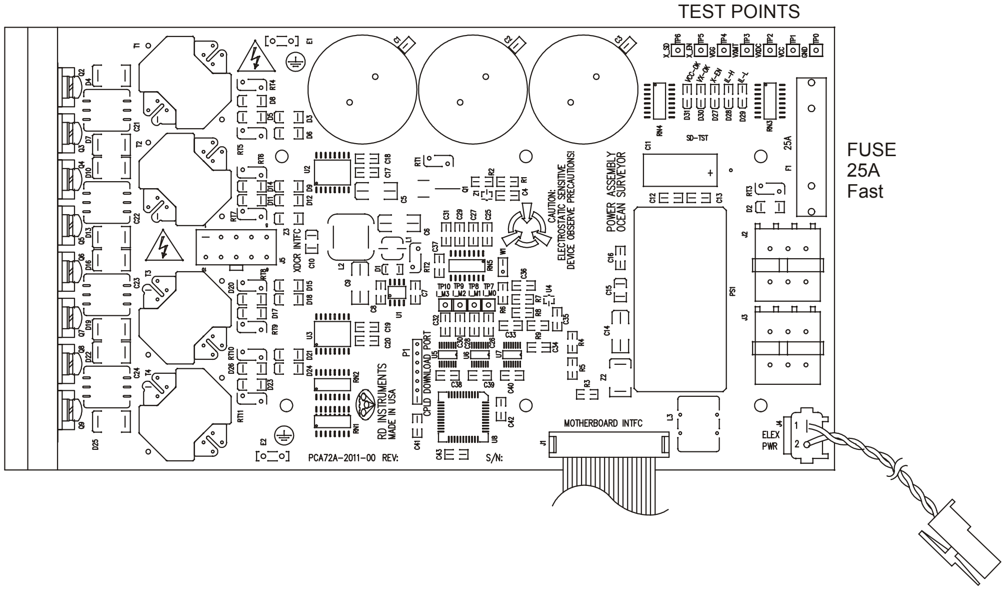


Figure 12. Power Assembly Board

> **CAUTION.** Do NOT ping the Ocean Surveyor with the transducer in air. The power assembly board will short, causing the electronics chassis to no longer communicate. The transducer is pinged by sending a CS or PT5 command or if *VmDas* is started for collecting data – either of these methods will cause damage if the transducer is in air.

Mother Board.

- Uses the Power Amplifier circuit to generate the high-amplitude pulse AC signal that drives the sonar transducers. The Power Amplifier sends the drive signal to the Beam Former Board (located in the transducer assembly).
- Real time clock.
- Generates most of the timing and logic signals used by the Ocean Surveyor.
- Analog to Digital converter.
- Digitizes information from sensors.

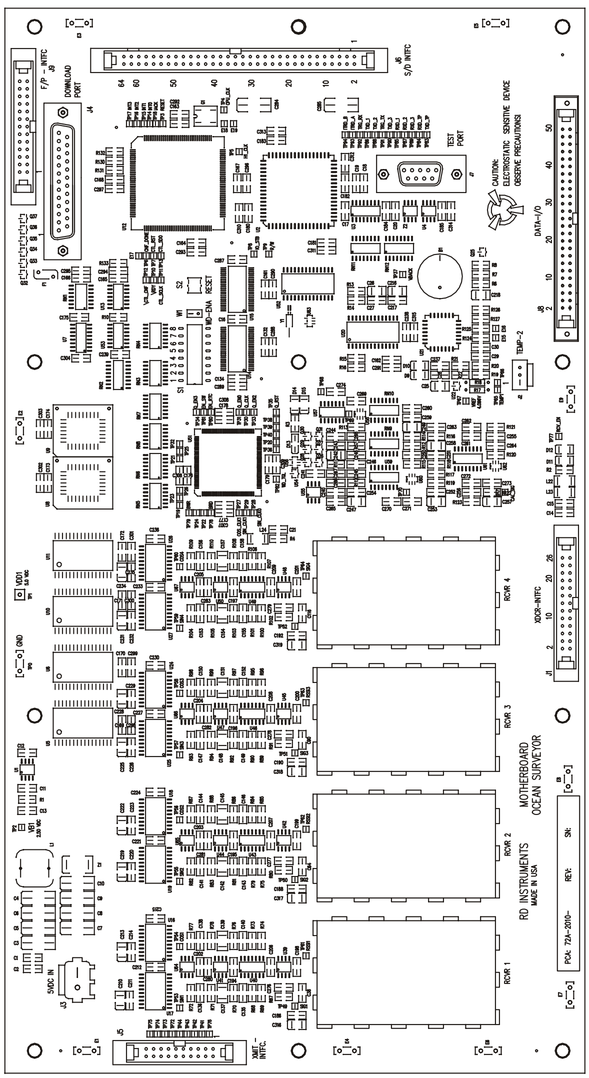


Figure 13. Motherboard

Transducer Interface Board.

- Routs all connections from the transducer cable connector on the rear of the Electronic Chassis to the motherboard.

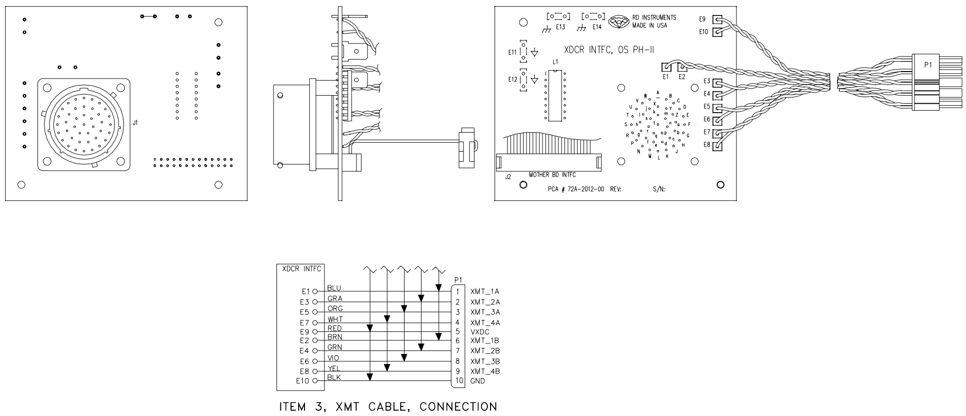


Figure 14. Transducer Interface Board

Data I/O Interface Board.

- Routs all connections from the serial cable connectors on the rear of the Electronic Chassis to the motherboard.

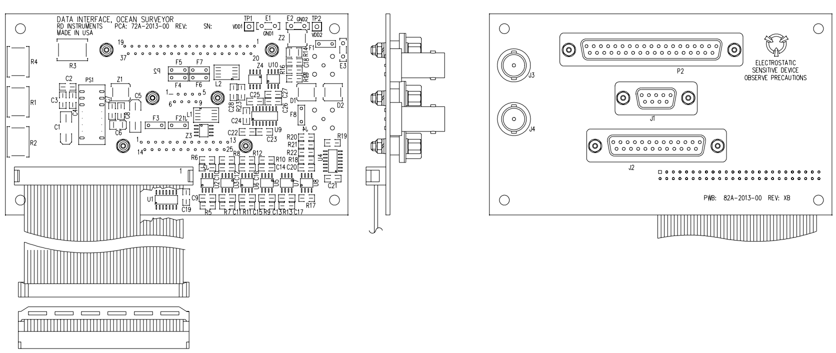
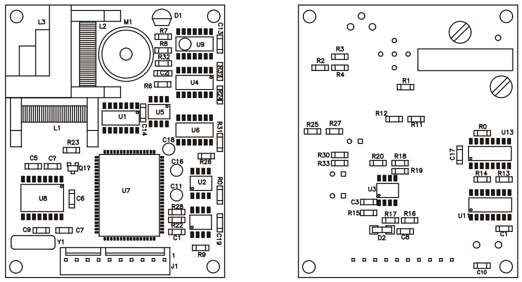


Figure 15. Data I/O Interface Board

***TCM2 Board*.**

- Compass and attitude sensor circuits.



Component Side Solder Side

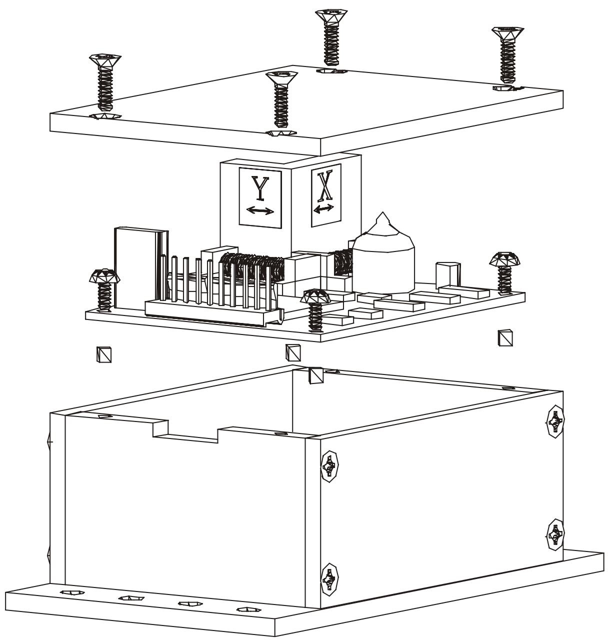


Figure 16. TCM2 Board

NOTE. Only Ocean Observers have the TCM2 compass installed.

Beam Former Board.

- Tuning functions.
- Receiver functions.
- Temperature sensor.

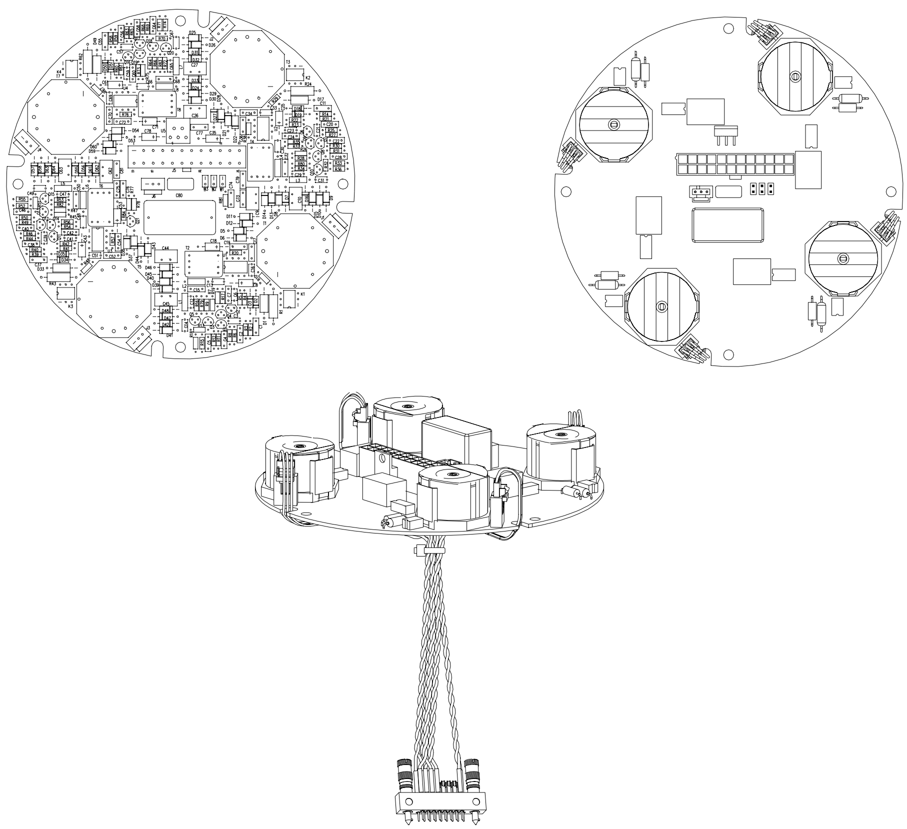


Figure 17. Beam Former Board

NOTES